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Use of Diphacinone-treated Bait Blocks for Control  
of the Northern Pocket Gopher

By

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ABSTRACT

The efficacy of a paraffinized diphacinone (50 ppm) grain bait formed in 113 g blocks and a strychnine (500 ppm) hulled oat bait was tested on the northern pocket gopher. Bait was applied under field conditions by hand methods. The diphacinone bait blocks averaged 70.7 percent reduction in gopher activity 28 days after application. The strychnine bait averaged 78.4 percent reduction in gopher activity during the same period.

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## INTRODUCTION

The use of semipermanent baits for control of pocket gophers was explored by Marsh and Pleece (1960) and more recently by Tumberg, et al (1984). Their investigations showed initial control of the resident gopher population and potential for control of immigrating gophers that fed on bait remaining from the original treatment. A commercially available semipermanent bait for gopher control has been registered under an intrastate registration in California for some time (Marsh 1987). Recently an attempt has been made to introduce this control method to a wider market (J.T. Eaton & Co.). A field study was conducted to evaluate the efficacy of this technique on the northern pocket gopher (Thomomys talpoides) in Montana.

## OBJECTIVE

The objective of this study was to test the efficacy of a paraffinized diphacinone (50 ppm) bait block for control of the northern pocket gopher under field conditions in Montana.

## STUDY AREA

Five study plots (4 treatment, 1 control) were selected from alfalfa and grass hayfields occupied by pocket gophers near Lewistown, Fergus County, Montana. The study period began September 20, 1987 and ended October 30, 1987. Below normal precipitation fell on the study area in August and September and only trace amounts fell during the study period. As a result, the soil was hard and compacted and soil moisture was well below normal. Mound building activity by the gophers occurred in early September after light rains but virtually ceased during October. Temperatures during the study period ranged from 25°F to 75°F.

## METHODS

A paraffinized diphacinone (50 ppm) mixed-grain bait formed into 113 g blocks (12x4x2 cm) was tested. A commercial pocket gopher bait (500 ppm strychnine on whole, hulled oats) was used as an efficacy standard. Each test was replicated twice.

The diphacinone bait blocks were applied to pocket gopher systems at sites of most recent mound building activity. One application of two bait blocks was made per burrow system by excavating a lateral tunnel back to the main tunnel and inserting one block in each direction of the tunnel. The opening excavated for bait block placement was closed with a clod of soil or plug of sod in a manner that left the tunnel open under the seal. Where the high density of pocket gophers made it difficult to determine individual systems the maximum distance between bait placement was 30 feet.



The strychnine bait was applied by hand using a probe to locate a pocket gopher tunnel. Approximately 5 g of bait was placed in the tunnel through the probe hole. Two to three bait placements were made per burrow system.

A 75 foot buffer zone was established around each plot to retard immigration of pocket gophers onto the study plots. The buffer area was treated with the same bait as the plot it bordered.

Efficacy was measured using active burrow counts to determine reduction in pocket gopher activity. A minimum of 20 active gopher burrows were located per study plot. Pocket gopher activity separated by a distance of 40 or more feet was considered a separate burrow system. Burrow systems were opened and any burrow not closed by gopher activity after 48 hours was considered inactive.

At 14 and 28 days posttreatment the burrow systems marked active during the pretreatment census on each study plot were opened. Each burrow was checked at 24 and 48 hours after opening. Any opened burrow that remained open was considered inactive as a result of the bait treatment.

A control plot was monitored for pocket gopher activity in the same manner as the treatment plots. No bait was applied to the control plot.

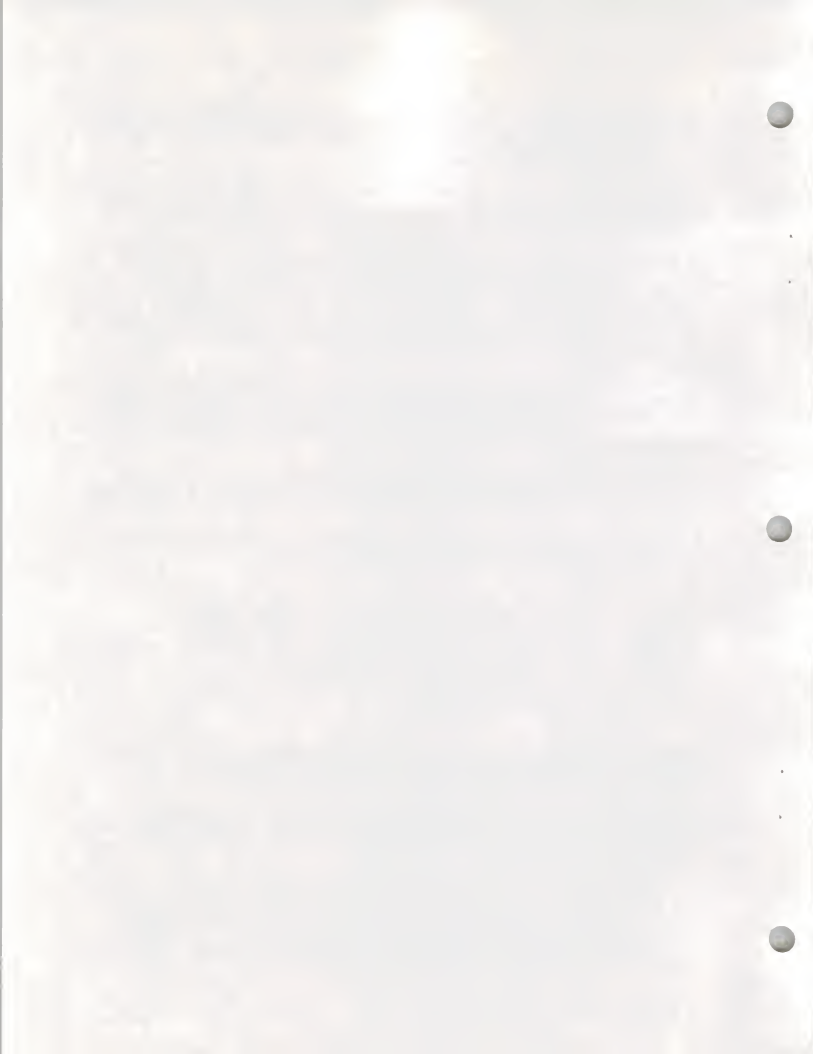
Percent reduction in activity was calculated using the following formula (Henderson and Tilton 1955).

$$\text{Percent Reduction in Active Burrows} = 1 - \frac{\text{Holes Closed Posttreatment (Treatment Plot)} \times \text{Holes Closed Pretreatment (Control Plot)}}{\text{Holes Closed Pretreatment (Treatment Plot)} \times \text{Holes Closed Posttreatment (Control Plot)}} \times 100$$

Time required for bait application and amount of bait applied per acre were recorded. Application labor and bait cost for the strychnine and bait block treatments were compared.

Following the 28 day posttreatment census, 20 bait placement sites on each study plot treated with bait blocks were selected randomly and excavated. The number of bait blocks remaining at each site was recorded.

For the purpose of testing methodology, three gophers on one of the bait block treatment plots were live trapped, fitted with radio transmitter collars and released at the site of capture. In addition, radio transmitters were embedded in four bait blocks. One unmarked and one radio-tagged bait block was placed



in the burrow system of each of the radio-tagged gophers. The fourth radio-tagged bait block and an unmarked bait block was placed in the burrow system of an unmarked gopher. Movements of the radio-tagged gophers and bait blocks were recorded and subsequently recovered to determine their fate.

## RESULTS

After excavating the bait block placement sites we found that both blocks had been removed from 35 (87.5%) of the sites sampled. Of the remaining 5 (12.5%) sites sampled, one of the two blocks had been removed. Two of the five remaining bait blocks were partially consumed.

Reduction in pocket gopher activity on the plots treated with diphacinone bait blocks averaged 70.7 percent 28 days after treatment. This compares with an average 78.4 percent reduction in activity on the plots treated with strychnine baits (Table 1).

We baited an average of 1.5 acres per manhour with strychnine bait using the hand probe method. The application rate was 1.33 pounds of bait per acre at a bait cost of about \$1.65 per acre. We treated 0.5 acres per manhour with bait blocks. Each acre averaged 7.5 pounds of blocks (15 sets/acre) at a bait cost of \$7.58 per acre based on suggested retail price (M. Godfrey, pers comm).

Each of the four radio-tagged bait blocks were moved from their initial placement location. Three of the blocks were recovered 14 days after application. The fourth block was not recovered because of transmitter failure. Two transmitter blocks were found alone in gopher tunnels and the third was found in a food cache of alfalfa roots along with an unmarked bait block. Blocks were moved from 7 to 27.5 feet from their original placement locations. They were found at depths from 16 to 26 inches. Recovered blocks had been fed on by gophers and their individual weights had decreased 30 g (26.5%), 41 g (36.3%) and 48 g (42.5%). A surface mold covered each of the bait blocks recovered. The blocks had become softer and crumbly compared to their original hard, brittle composition and could be crushed rather easily by hand.

Two of the radio-tagged gophers were recovered dead 14 days after application. One gopher was found in a nest of dry grass at a depth of 31 inches. The second gopher was found in a food cache of alfalfa roots at a depth of 20 inches. Necropsy of both animals revealed extensive subdermal hematomas and bloody fluid in the abdominal and thoracic cavities. The third radio-tagged gopher was kill-trapped 28 days after bait application. The carcass showed no visual signs of anticoagulant poisoning. The radio-tagged and unmarked bait blocks placed in this gopher's system had been moved but transmitter failure prevented recovery.





TABLE 1. Percent Reduction in Pocket Gopher Activity Using Diphacinone Bait Blocks and Strychnine Grain Bait.

	<u>Plot No.</u>	<u>Date</u>	<u>Average</u>	<u>Date</u>	<u>Average</u>
		<u>10/15/87*</u>		<u>10/29/87*</u>	
Bait Blocks	1	80.0	56.7	82.4	70.7
Bait Blocks	2	33.3		59.0	
Strychnine	3	55.2	57.6	80.3	78.4
Strychnine	4	60.8		76.5	
Control	5	46.4		39.3	

\* 10/15/87 and 10/29/87 are 14 and 28 days after treatment, respectively.



## DISCUSSION AND RECOMMENDATIONS

The management strategy for semipermanent baits is to control a resident gopher and one or more immigrant gophers with one bait application. This study showed that diphacinone bait blocks and strychnine baits gave similar efficacy over a short term, but we did not determine if bait blocks continued control beyond the resident population. If agricultural producers are to accept semipermanent baits they must feel confident that the additional cost and labor results in control of immigrant gophers and gives a longer period of control. We recommended that further investigations be conducted to determine 1) if control of gophers extends beyond the resident population, 2) how long residual control lasts, 3) the longevity of the bait blocks within the environment of a burrow system, 4) the acceptance and palatability of the bait blocks over time, and 5) the cost and efficacy of bait blocks compared to currently available control methods. This information is needed before vertebrate pest professionals can confidently recommend this method to growers as an effective and economical control option.

## ACKNOWLEDGEMENTS

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